

**HUAWEI**

RAN

# **MOCN Parameter Description**

|              |            |
|--------------|------------|
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# About This Document

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# 1 Change History

The change history provides information on the changes in different document versions..

## Document and Product Versions

| Document Version   | RAN Version |
|--------------------|-------------|
| 01 (2009-03-30)    | 11.0        |
| Draft (2009-03-10) | 11.0        |
| Draft (2009-01-15) | 11.0        |

This document is based on the BSC6810 and 3900 series NodeBs.

The available time of each feature is subject to the RAN product roadmap.

There are two types of changes, which are defined as follows:

- Feature change: refers to the change in the MOCN feature.
- Editorial change: refers to the change in the information that was inappropriately described or the addition of the information that was not described in the earlier version.

### 01 (2009-03-30)

This is the document for the first commercial release of RAN11.0.

Compared with issue draft (2009-03-10) of RAN11.0, this issue optimizes the description.

### Draft (2009-03-10)

This is the second draft of the document for RAN11.0.

Compared with draft (2009-01-15), draft (2009-03-10) optimizes the description.

## **Draft (2009-01-15)**

This is the initial draft of the document for RAN11.0.

# 2 MOCN Introduction

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The 3G network construction requires a considerable investment. If operators cooperate to construct the network and share network infrastructure, they can save the investment in the 3G network construction. In addition, this greatly accelerates the network construction and shortens the time to deploy the network.

To enable different operators to share some network elements (NEs) in the 3G network, the UMTS introduces the Iu Flex and RAN sharing features in 3GPP R5 and the Multi-Operator Core Network (MOCN) feature in 3GPP R6.

The difference between MOCN and RAN sharing is that MOCN uses common carrier resources and RAN sharing uses independent carriers. The identical feature is that the CN side is independent for both MOCN and RAN sharing. That is, the CN nodes belong to respective operators. When common carrier resources are used, multiple operators share cell resources. For independent carriers, resources can be used more efficiently.

In the Huawei MOCN solution, all operators share common carrier resources. That is, all access network resources (including spectrum resources) are shared. This solution requires interoperability between the CN and the UEs. The UEs of R6 or later versions support this solution. The pre-R6 UEs do not support this solution. On the Huawei system side, however, the pre-R6 UEs can access the MOCN and be routed to a correct CN.

Huawei MOCN solution is based on the following situations:

- One operator obtains the 3G license and can share its spectrum resources with other operators.
- Multiple operators have spectrum resources and put them into the resource pool. Other operators who do not have spectrum resources can use this resource pool.

Huawei MOCN solution has the following characteristics:

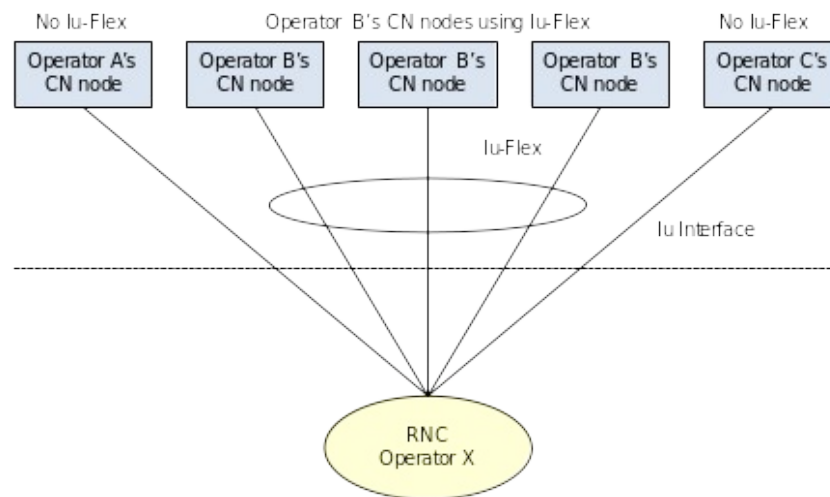
- The shared network is constructed by one operator and shared by several other operators. The operators on the shared network share their spectrum resources (if any). All spectrum resources are

centralized and shared among all the operators regardless of whether they provide spectrum resources.

- Multiple CNs connect to the shared RAN.
- The shared RAN and the CNs of different operators support Iu Flex.
- The shared RAN needs to route UEs that subscribe to the operators to respective CNs.

Figure 2-1 shows the MOCN solution.

**Figure 2-1** MOCN solution



## Intended Audience

This document is intended for:

- System operators who need a general understanding of MOCN feature.
- Personnel working on Huawei products or systems.

## Impact

- Impact on system performance
 

In the MOCN solution, operators have their own CNs, and they share the RAN only on the shared network. The MOCN solution effectively saves the investment costs involved in site leasing, site construction, transmission equipment, and RAN equipment. It allows operators to retain independent CNs, services, and charging.

  - Compared with the RAN sharing solution, the MOCN solution can make better use of resources.
  - The MOCN solution also has some limitations. Operators need to cooperate more closely and may face more restrictions because the degree of independence decreases.
- Impact on other features

The current solution provided by Huawei does not support MOCN and RAN sharing simultaneously.

If an operator wants to deploy a dedicated cell during the deployment of MOCN, the cell is regarded as a private cell of the operator in the MOCN scenario.

## Network Element Involved

Table 2-1 lists the Network Elements (NEs) involved in MOCN.

**Table 2-1** NEs involved in MOCN

| UE                                                                                                                                                                                                                                                                                                                                                                                                                                     | NodeB | RNC | MSC Server | MGW | SGSN | GGSN | HLR |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----|------------|-----|------|------|-----|
| √                                                                                                                                                                                                                                                                                                                                                                                                                                      | √     | √   | √          | -   | √    | -    | -   |
| <p> <b>NOTE</b></p> <ul style="list-style-type: none"> <li>• -: not involved</li> <li>• √: involved</li> </ul> <p>UE = User Equipment, RNC = Radio Network Controller, MSC Server = Mobile Service Switching Center Server, MGW = Media Gateway, SGSN = Serving GPRS Support Node, GGSN = Gateway GPRS Support Node, HLR = Home Location Register</p> |       |     |            |     |      |      |     |

# 3 MOCN Description

---

MOCN is associated with RAN Sharing. In MOCN, RAN nodes (RNC and NodeB) and carrier resources are shared. In the MOCN solution, none of the UTRAN features can be controlled separately by different operators. Therefore, the optional features must be purchased by all the operators before they are available.

The optional features are as follows:

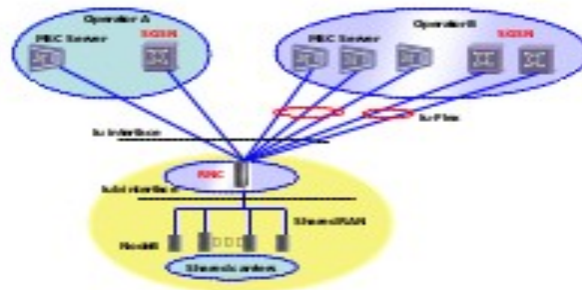
- [Carrier Sharing](#)
- [Deployment of Independent NodeBs](#)
- [MOCN Mobility Management](#)
- [MOCN Load Balancing](#)
- [Independent Performance Measurement of MOCN](#)

## 3.1 Carrier Sharing

### 3.1.1 Overview

As shown in [Figure 3-1](#), when the MOCN solution is used, multiple operators share equipment and resources in the RAN. In this case, each cell in the shared RAN belongs to multiple operators.

**Figure 3-1** MOCN concept



The MOCN solution provides the following functions:

- **PLMN ID broadcasting**  
To notify a UE of the information about multiple operators, the RAN broadcasts the PLMN IDs provided from the MSCs in the Master Information Block (MIB). In this way, the UE can select a proper PLMN.
- **CS/PS consistency**  
To prevent selection of two CN operators (different CN operators in the CS domain and PS domain) for a UE, the RNC and CN must cooperate with each other to guarantee CS/PS consistency.

The MOCN solution has two types of UEs:

- **Supporting UE:** UEs that support MOCN. On the MOCN-based network, the RNC broadcasts the PLMN information (Multiple-PLMN list IE in the MIB) of multiple operators in the system information. The supporting UE interprets the PLMN information and notifies the RNC of the selected PLMN through the Initial Direct Transfer message. The supporting UE must support the 3GPP R6 protocol.
- **Non-supporting UE:** UEs that do not support MOCN. The non-supporting UE cannot interpret the PLMN information of multiple operators in the system information.  
The RNC selects appropriate operators in different ways for the supporting UE and non-supporting UE.



**NOTE**

The MOCN feature has requirements for the UE versions. Some R5 UEs (pre-R6 UEs) may implement the R6 MOCN feature. The RNC supports the pre-R6 UEs that support MOCN independently.

### 3.1.2 Cell Configuration for Enabling MOCN

This section describes the operations such as setting the RNC to support MOCN, adding operators, adding operator groups, adding NodeBs, and adding cells.

- Setting the RNC to support MOCN
  - When the **MOCNSupport** parameter (configured in the RNC) in the **SET OPERATORSHARINGMODE** command is set to **YES**, the RNC support MOCN.
  - If the **FUNCTIONSWITCH4** parameter (configured in the RNC) in the **ACT LICENSE** command is set to **MOCN\_PACKAGE**, the MOCN license for the operator is activated.
- Adding operators

Run the **ADD CNOOPERATOR** command to add an operator to the RNC. To enable the MOCN feature, operator type is required. You can set the operator type to the primary, secondary, outer, or common operator by setting the **OperatorType** parameter (configured in the RNC) to **PRIM**, **SEC**, **OUTER**, or **COMM** respectively. The four types of operators are described in [Table 3-1](#).

**Table 3-1** Operator types

| Operator Type | Description                                                                                                                                                                                                |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PRIM          | Primary operator: determines the functions to be supported by the entire RAN system and allocates licenses to secondary operators. The primary operator permits registration and access of UEs.            |
| SEC           | Secondary operator: The functions to be supported by the entire RAN system and the licenses of secondary operators are controlled by the primary operator. Secondary operators permit access of UEs.       |
| OUTER         | Outer operator: In mobility management, UEs need to be handed over from the operator of the source RNC to the operator of the target RNC.                                                                  |
| COMM          | Operator that supports non-supporting UEs: The PLMN ID is indicated in the system broadcast information as defined for conventional networks, which non-supporting UEs understand as the serving operator. |



**NOTE**

If the operator is not the primary operator or a secondary operator of the source RNC, you need to specify the operator as an outer operator so that the operator supports mobility management.

- Adding operator groups

To facilitate maintenance and management, the concept of operator group is introduced. Each operator group must be configured with 1–

4 operators (primary operator and secondary operators) and 0-1 common operator. Each cell corresponds to an operator group. You can use the **ADD CNOPERGROUP** command to add an operator group.

- Adding NodeBs

To add a NodeB of MOCN type, use the **ADD NODEB** command with **SharingType** to be **MOCN** and **RscMngMode** to be **SHARE**. NodeBs of MOCN type share transmission equipment.

- Adding cells

To configure an operator group for a cell, use the **ADD CELLSETUP** or **ADD QUICKCELLSETUP** command. If the cell is configured with multiple operators (including the primary operator and secondary operators), you must configure the LAC, RAC, and SAC for all the operators and ensure that they are consistent.

### 3.1.3 Interfaces for the MOCN RNC

All the physical connections supported by the MOCN RNC are the same as those supported by the non-shared RNC.

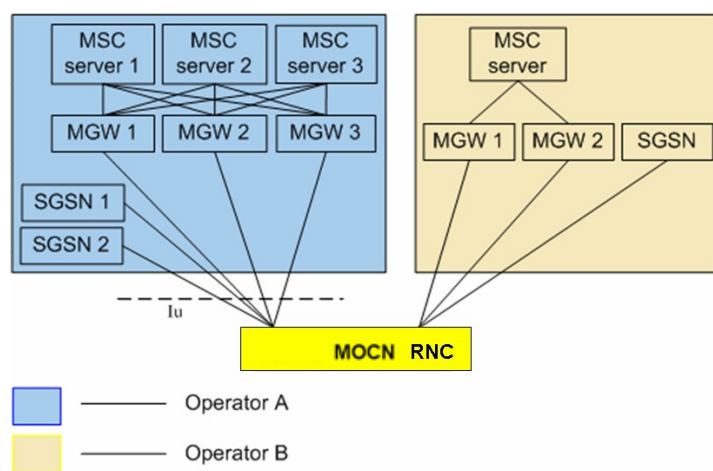
#### Iu Interface

Each operator uses one or more Iu interfaces to connect to their own CN nodes.

In the MOCN RNC, a Global CN ID is added to each CN node. The Global CN ID consists of the PLMN ID and the CN ID.

Figure 3-2 shows an example of the RNC shared by operators A and B. Operator A adopts Iu Flex, and operator B does not adopt Iu Flex.

**Figure 3-1** Example of RNC shared by two operators



The switch for activating or deactivating Iu Flex can be set. Thus, each operator can activate or deactivate Iu Flex separately. The Iu Flex configuration in the MOCN RNC is similar to the Iu Flex configuration in

the non-shared RNC. For details, see the *RAN Sharing Parameter Description* and *Iu Flex Parameter Description*.

## Iub Interface

On the MOCN NodeB, the Iub transmission resources are all shared among operators.

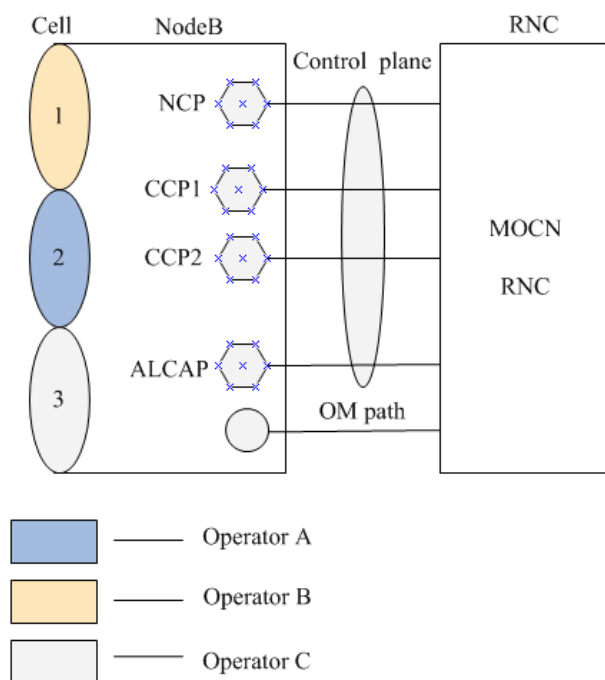
- Iub control plane transmission resources

As shown in [Figure 3-3](#), the NCP, CCP, and ALCAP links and the OM channels are shared on Iub by the operators that share the NodeB. Each NodeB has its own unique NCP link and ALCAP link and several CCP links. The mapping between the cell and the CCP links is not fixed. Even if multiple OM channels are supported, only one OM channel is recommended for each NodeB.

The NCP link is used for the common NBAP procedures such as cell setup, cell reconfiguration, common transport channel setup, and radio link setup. All the operators must share the NCP link.

The CCP links are selected according to the load sharing policy.

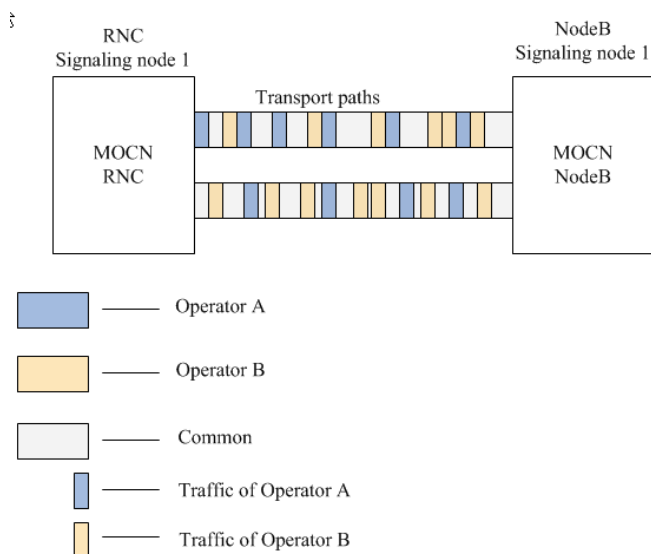
**Figure 3-1** Shared connections at the Iub control plane



- Iub user plane transmission resources

As shown in [Figure 3-4](#), the transmission resources at the Iub user plane are shared by operators.

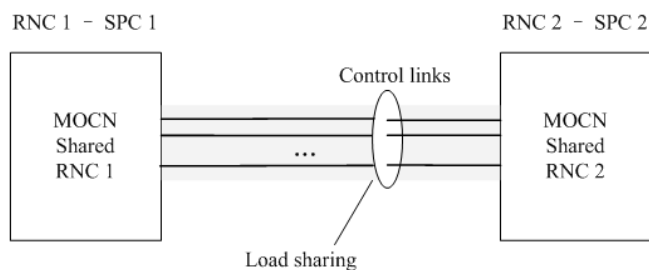
**Figure 3-2** Iub user plane shared by operators A and B



## Iur Interface

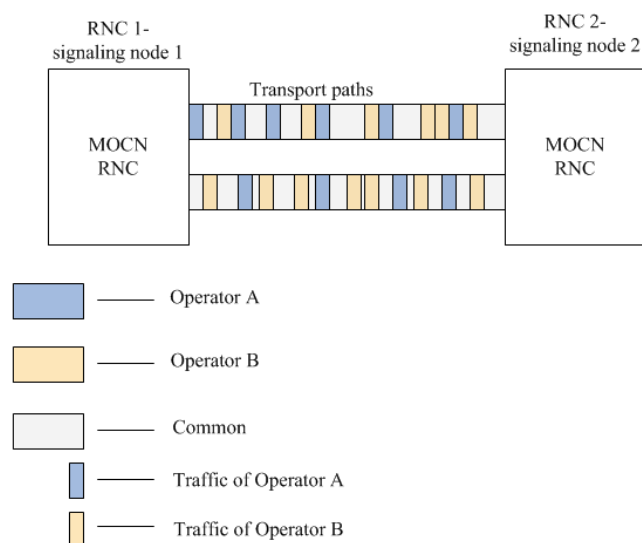
The Iur transmission resources are shared by all the operators. As shown in Figure 3-5, the Iur control plane is shared. In ATM transmission mode, the MTP3-b links used for connecting the RNCs work in load sharing mode.

**Figure 3-1** Iur control plane of two RNCs shared by operators A and B



As shown in Figure 3-6, the Iur user plane is shared. In ATM transmission mode, all the AAL2 paths are shared by all the operators. Each AAL2 path can carry traffic of all the operators.

**Figure 3-2** Iur user plane of two RNCs shared by operators A and B



### 3.1.4 Multi-PLMN System Information Broadcasting

The configuration of multiple operators in a cell is described in section [3.1.2 "Cell Configuration for Enabling MOCN."](#)

The PLMN identity (Common PLMN ID), MIB PLMN identity, and Multiple PLMN ID LIST fields must be set in the MIB in the MOCN cell. The Common PLMN ID and Multiple PLMN LIST field values are available in the cell configuration information.

- If the value of MIB PLMN identity is set to True, the supporting UE selects the PLMN identity (Common PLMN ID) as a candidate PLMN.
- If the value of MIB PLMN identity is set to False, the supporting UE (3GPP R6 or later and supporting MOCN) selects the PLMN only from the Multiple PLMN ID LIST.
- The non-supporting UE (before 3GPP R6 and not supporting MOCN) does not indicate the PLMN that is selected by the UE itself.

The principles for broadcasting system information in a cell are as follows:

- If the operator group of a cell includes a common operator, the PLMN ID of the common operator is used as the Common PLMN ID, and the PLMN IDs of actual operators are broadcast in the Multi PLMN LIST. If the operator group of a cell does not include a common operator, the PLMN ID of the first operator is used as the Common PLMN ID. The PLMN identity IE is set to the Common PLMN ID. If the MIB PLMN Identity is set to TRUE, the Multiple PLMN List IE is set to the PLMN ID of any other operator.
- If the cell is configured with only one operator, the Multiple PLMN LIST is not broadcast to the UEs.
- If an operator does not have the MOCN license, the Multiple PLMN LIST does not include this operator.

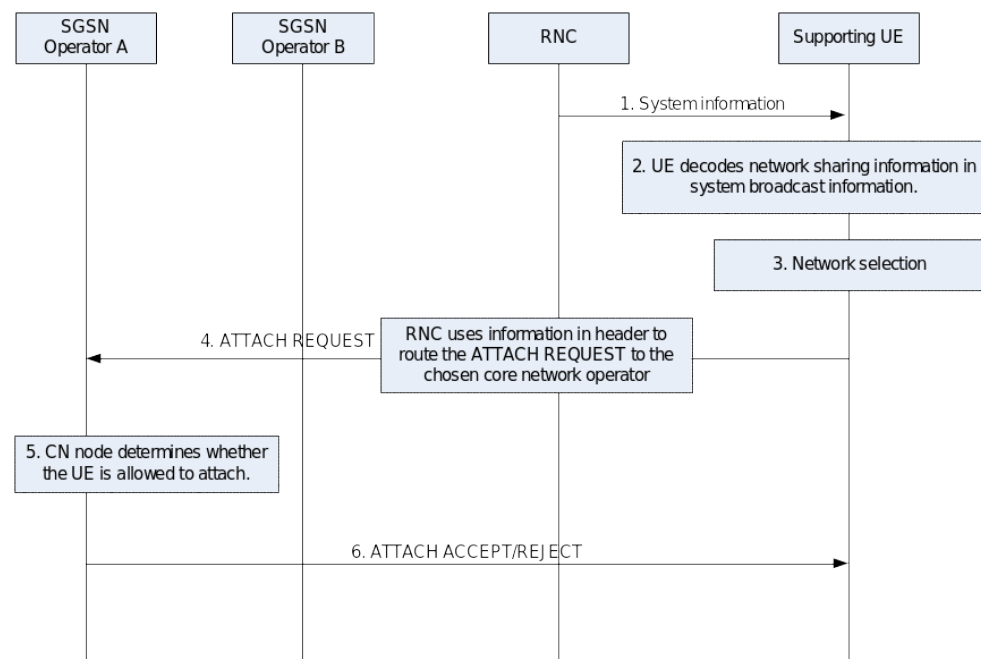
- If the Iu-CS interface and Iu-PS interface provided by an operator are faulty, the PLMN ID of the operator is deleted from the MIB.
- The Multi PLMN LIST broadcasting is controlled by the RNC switches listed below.
  - If the Multi PLMN LIST delivery switch (**COMM\_MIB\_MULTI\_PLMN\_LIST\_ALLOWED\_SWITCH** configured in RNC) of **MocnControlSwitch** in the **SET OPERATORSHARINGMODE** command is enabled, the MIB in the cell system information carries the Multi PLMN LIST. Otherwise, the MIB does not carry the Multi PLMN LIST.
  - If the system information update switch of **PROCESSSWITCH** in the **SET RRCTRLSWITCH** command is enabled after the Iu interface is reset, and the Iu-CS interface and Iu-PS interface provided by an operator are faulty, the PLMN ID of the operator is deleted from the MIB. If the CS/PS Iu interface is recovered, the PLMN ID of the operator is included in the Multi PLMN LIST.

### 3.1.5 Multi-PLMN Route Selection

The IDT message of the supporting UE carries the PLMN Identity. Thus, the RNC knows the operator to which the UE subscribes.

- If the operator adopts Iu Flex networking, the NAS Node Selection Function (NNSF) of Iu Flex is performed to select a proper CN node from the CN node set of the operator.
  - If no proper CN node can be selected, select the existing CN node of an operator according to the load balancing principle. If the operator does not adopt Iu Flex networking, select the CN node of the operator, as shown in [Figure 3-7](#).

**Figure 3-1** CN node selection



The non-supporting UE can receive the information about the Common PLMN in the MIB but cannot select the appropriate PLMN. The RNC generates an attempt queue according to the PLMN IDs of the actual operators of the cell and the existing information. It uses a two-level selection mechanism, that is, selecting the operator before selecting the CN node.

- NRI route

The MOCN requires that the CN of each operator must indicate valid NRI information in the allocated TMSI or P-TMSI. For details about the allocation principle, see the 3GPP TS 23.251. If a UE accesses the network by using the TMSI or P-TMSI, the RNC decodes the NRI in the IDNNS. According to the data configuration negotiated by the RNC and the CN, the CN that was previously accessed by the UE and the operator of the CN can be selected.

- HPLMN

The UE that accesses the network by using the IMSI can obtain the home PLMN (HPLMN) according to the mobile country code (MCC) and the mobile network code (MNC).

For the UE that accesses the network by using the TMSI or P-TMSI, the location area identity (LAI) may indicate the PLMN or HPLMN previously accessed by the UE

- Default operator

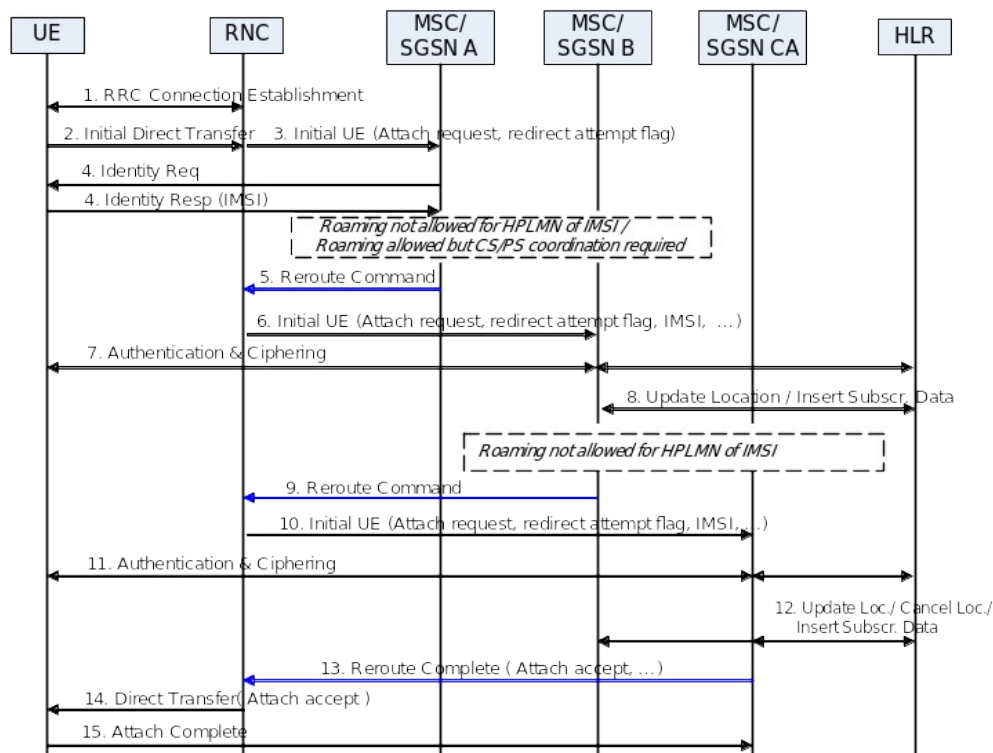
The **DefaultCnOp** parameter (configured in the RNC) in the **SET OPERATORSHARINGMODE** command specifies the default operator.

- Other operators in the cell

The attempt priority is arranged in ascending order based on the numbers of attempts of different operators in the cell.

After an access attempt is performed in the redirection process, the MSC or SGSN serving the UE finally allocates an NRI to the UE. For details, see the 3GPP TS23.251. This allows the RAN to route the subsequent access information of the UE to the serving MSC or SGSN. Thus, in the MOCN application scenario, NRIs must be configured at the RNC and CN sides. The operator index (whether to support MOCN or not), NRI in the CS domain, NRI length in the CS domain, and NULLNRI value can be configured by setting the parameters **CnOpIndex**, **CsNriCfgMode**, **CSNRILength**, and **NullNRI** in the **SET OPERATORCFGPARA** command.

In the attempt process, the RNC sends the INIT UE MESSAGE carrying the redirectAttemptFlag to the CN, requesting the CN to initiate the redirection process. The LAI/SAI/RAI is set to the Common PLMN ID in the MIB. [Figure 3-8](#) shows the redirection process.

**Figure 3-2** Redirection process by the non-supporting UE

### 3.1.6 CS/PS Consistency

CS/PS consistency is ensured by both the RNC and the CN to prevent selection of two CN operators (different CN operators in the CS and PS domains) for a UE.

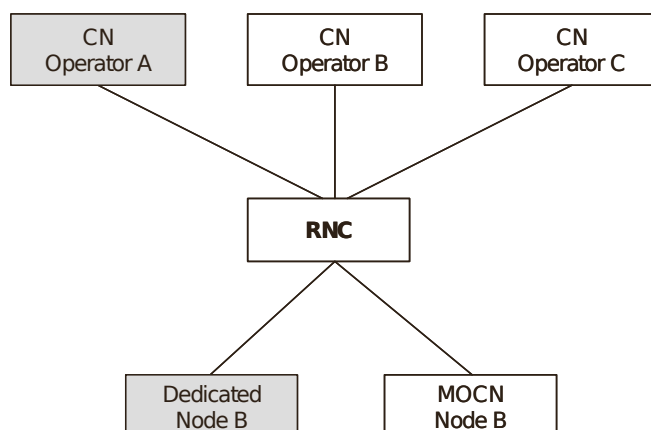
- In a network with the Gs interface, the registration information in the CS domain is forwarded by the PS domain. Thus, CS/PS consistency is ensured by the SGSN.
- In a network without the Gs interface, CS/PS consistency is ensured by the RNC.
- For UEs in the connected state, the RNC selects the operator in the domain with the existing signaling connection on the Iu interface.

**NOTE**

The RNC and CN may not ensure CS/PS consistency for UEs in the idle state.

## 3.2 Deployment of Independent NodeBs

To meet special requirements of different operators, the RNC can connect to a NodeB shared by multiple operators, then called MOCN NodeB. The RNC can also connect to a NodeB dedicated to a specific operator, not shared by any other operator. [Figure 3-9](#) illustrates these two situations.

**Figure 3-1** Two types of NodeB networking

As shown in [Figure 3-9](#), the dedicated NodeB is the dedicated NodeB of operator A. All the UEs that enter the network through the dedicated NodeB connect to the CN node of operator A.

## 3.3 MOCN Mobility Management

The RNC provides the parameters for determining whether to support inter-PLMN intra-RAT and inter-RAT handovers. The parameters can be set, and the default value is **NO**. If the parameters are set to **YES**, UEs can move among PLMNs. Inter-PLMN handover ensures service continuity and improves user experience. It also provides a more flexible mobility management policy and thus meets diversified network sharing requirements of operators.

- If the **InterPlmnHoAllowedIntraRat** parameter (configured in the RNC) in the **SET OPERATORSHARINGMODE** command is set to **YES**, the RNC supports inter-PLMN intra-RAT handovers. That is, UEs can move among PLMNs. If this parameter is set to **NO**, the RNC does not support inter-PLMN intra-RAT handovers.
- If the **InterPlmnHoAllowedInterRat** parameter (configured in the RNC) in the **SET OPERATORSHARINGMODE** command is set to **YES**, the RNC supports inter-PLMN inter-RAT handovers. That is, UEs can move among PLMNs. If this parameter is set to **NO**, the RNC does not support inter-PLMN inter-RAT handovers. The default value of the **InterPlmnHoAllowedInterRat** parameter (configured in the RNC) is **YES**.



### NOTE

When inter-PLMN handovers are disabled, MOCN mobility management can be performed to prevent UEs from being handed over to cells in the non-home PLMN in the scenarios of soft handover, hard handover, intra-frequency handover, and inter-frequency handover.

### 3.3.1 Neighboring Cell Configuration

This version introduces the concept of operator group. By default, UEs are not allowed to perform inter-PLMN handovers.

If the **InterPlmnHoAllowedIntraRat** parameter (configured in the RNC) in the **SET OPERATORSHARINGMODE** command is set to **NO**, only the cells of the same operator can be configured as neighboring cells. If this parameter is set to **YES**, there is no limitation on neighboring cell configuration.

If the **InterPlmnHoAllowedInterRat** parameter (configured in the RNC) in the **SET OPERATORSHARINGMODE** command is set to **NO**, configuration is allowed only when the MCC and MNC of the neighboring GSM cell are in the operator list of the original cell (WCDMA). If this parameter is set to **YES**, there is no limitation on neighboring cell configuration.

Operator group index in the NRNC cell can be configured by setting the **CnOpGrpIndex** parameter (configured in the RNC) in the **ADD NRNCCELL** command. If the operators configured in the NRNC do not exist in the SRNC, it is possible to use the **ADD CNOOPERATOR** command to add outer operators and configure the corresponding operator group according to the operator group of the NRNC cell.

### 3.3.2 Measurement Messages Handling

In contrast to RAN sharing, MOCN cannot restrict handovers between cells of different operators only through neighboring cell configuration. The RNC needs to check the neighboring cell list when delivering a measurement control message. The neighboring cell relation involves intra-frequency and inter-frequency handovers between the MOCN NodeB cell, RAN sharing cell, and independent NodeB cell in the RNC.

When delivering an intra-frequency or inter-frequency measurement control message, the RNC determines whether the PLMN ID of the UE is in the PLMN ID LIST of the neighboring cell if the **InterPlmnHoAllowedIntraRat** parameter (configured in the RNC) in the **SET OPERATORSHARINGMODE** command is set to **NO** and the PLMN ID of the UE is valid. Then, only the information about the neighboring cells of the same operator is delivered. The information about the cells of other operators is filtered out. If the PLMN that the UE accesses is not determined, the RNC delivers the information about all the neighboring cells. After the PLMN is determined, the RNC delivers the information about neighboring cells again, excluding the neighboring cells of the PLMN that the UE does not access.

If the **InterPlmnHoAllowedIntraRat** parameter (configured in the RNC) in the **SET OPERATORSHARINGMODE** command is set to **YES**, UEs can move without any restrictions.

The delivery of neighboring cell measurement control messages for the inter-RAT handover is not restricted by the **InterPlmnHoAllowedInterRat** parameter (configured in the RNC).

### 3.3.3 Limitations on Handover and Cell Update

In contrast to RAN sharing, MOCN cannot restrict handovers between cells of different operators only through neighboring cell configuration. The RNC needs to make decisions before a handover is performed. The handover decision made by an RNC involves intra-frequency and inter-

frequency handovers between the MOCN NodeB cell, RAN sharing cell, and independent NodeB cell.

If either **InterPlmnHoAllowedIntraRat** or **InterPlmnHoAllowedInterRat** (configured in the RNC) in the **SET OPERATORSHARINGMODE** command is set to **NO**, the handover and cell update are allowed only when the PLMN ID of the UE is in the target cell operator list. If either **InterPlmnHoAllowedIntraRat** or **InterPlmnHoAllowedInterRat** (configured in the RNC) is set to **YES**, the handover or cell update is not restricted.

During cell update or URA update, the SRNC determines whether to allow cell update or URA update after receiving the PLMN ID list of the target cell.

In the Iur RL Setup/Add process, the SRNC receives the PLMN ID list of the neighboring cell of the target cell and makes the next handover decision based on the PLMN ID list. The target neighboring cell may not be configured or may have been configured on the SRNC.

- If the target neighboring cell is not configured on the SRNC:
  - If the neighboring combination switch of **HoSwitch** in the **SET CORRMALGOSWITCH** command is enabled, the neighboring cells should be added to the neighboring cell list of the UE regardless of whether the cell is the best cell or not.
  - If the neighboring combination switch is disabled, the neighboring cells should be added to the neighboring cell list of the UE when the target cell is the best cell.
  - If the DRNC does not carry the PLMN ID list, the SRNC may be unable to perform a handover decision. It can perform a handover decision according to the PLMN ID in the SAI only after receiving the DRNC RL SETUP/ADD message.
- If the target neighboring cell has been configured on the SRNC, the PLMN ID list sent by the DRNC should be used.

### 3.3.4 RNC Relocation

If the SRNC can determine the CN operator of the target network (according to the available MOCN information, current PLMN ID, or similar information) during an RNC relocation, the SRNC should indicate the selected CN operator to the target network.

- During the inter-PLMN relocation from a single-operator cell or MOCN cell to a single-operator cell, the RNC sets the PLMN in the target RNC ID in the RELOCATION REQUIRED message to the PLMN configured for the cell. The source CN decodes the RELOCATION REQUIRED message and forwards it to the target CN if required.
- During the relocation from a single-operator cell or MOCN cell to an MOCN cell, if the RNC cannot determine the operator to which the UE is relocated, the RNC sets the PLMN in the target RNC ID in the RELOCATION REQUIRED message to the common PLMN configured for the cell. The source CN selects a CN to forward the message. The target CN sends the RELOCATION REQUEST message carrying the selected PLMN to the target RNC (TRNC).

The TRNC notifies the UE of the new PLMN ID through the UE configuration information. The non-supporting UE obtains the new PLMN ID from the PLMN identity in the message. The supporting UE obtains the new PLMN ID from the Primary PLMN identity in the message.

## 3.4 MOCN Load Balancing

This section describes how to guarantee load balancing among different operators and improve fairness of network sharing.

### 3.4.1 Load Balancing Among Operators

For a UE not supporting MOCN, the RNC selects a proper operator for the UE through the redirection function. In some cases, multiple operators may be able to provide services such as roaming for a UE. Thus, the load balancing mechanism is required to balance the load between operators and guarantee the fairness of network sharing.

The RNC supports the MOCN load balancing mechanism. During the first and subsequent attempts in the redirection process, the RNC selects an operator that has the fewest successful accesses so that multiple UEs can be evenly served by different CN operators. This also balances load between operators.

### 3.4.2 Load Balancing Among CN Nodes of an Operator

For details about load balancing among CN nodes of an operator, see the *Iu Flex Parameter Description*.

## 3.5 Independent Performance Measurement of MOCN

The RNC supports independent performance measurement. That is, operators can obtain traffic volumes and network quality information related to their specific usage and UEs attached to them.

In the performance measurement counters of the RNC, MOCN-related measurement counters are added, including transfer redirection due to different causes. When the RNC receives the RANAP DIRECT TRANSFER message (carrying the Redirection Indication) from the CN, as indicated by B in [Figure 3-10](#), it measures the counters listed in [Table 3-2](#).

**Figure 3-1** Measurement of redirection due to different causes



**Table 3-1** Redirection due to different causes

| Measurement Counter               | Cause of Redirection                      |
|-----------------------------------|-------------------------------------------|
| VS.IU.MOCN.CsPsCoordination       | CS/PS coordination required               |
| VS.IU.MOCN.LocAreaNotAllowed      | Location area not allowed                 |
| VS.IU.MOCN.PlmnNotAllowed         | PLMN not allowed                          |
| VS.IU.MOCN.RoamNotAllowed         | Roaming not allowed in this location area |
| VS.IU.MOCN.NoSuitableCell         | No suitable cell in location area         |
| VS.IU.MOCN.GprsServicesNotAllowed | GPRS services not allowed in this PLMN    |

# 4 MOCN Parameters

## 4.1 Description

**Table 4-1** MOCN parameter description

| Parameter ID               | Description                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MOCNSupport                | This parameter determines whether the RNC supports the MOCN function.                                                                                                                                                                                                                                                                                       |
| InterPlmnHoAllowedIntraRat | This parameter specifies whether intra-RAT handover of the UE among different operators is allowed.                                                                                                                                                                                                                                                         |
| InterPlmnHoAllowedInterRat | This parameter specifies whether inter-RAT handover of the UE among different operators is allowed.                                                                                                                                                                                                                                                         |
| CommPlmnUsingType          | This parameter determines whether Common PLMN ID is used when the RNC sends the INIT UE MESSAGE to the CN.                                                                                                                                                                                                                                                  |
| DefaultCnOp                | This parameter specifies the default operator that RNC chooses in the MOCN cell. The value 255 means that no default operator is defined.                                                                                                                                                                                                                   |
| MocnControlSwitch          | MOCN Control Switch.<br>1) COMM_MOCN_NRI_GLOBAL_CONFIG_MODE_SWITCH: When the switch is selected, the NRI of any CN node in the RNC is unique in the CS or PS domain.<br>2) COMM_MIB_MULTI_PLMN_LIST_ALLOWED_SWITCH: When the switch is selected, the operator information configured in the MOCN cell is sent as Multi PLMN List in the system information. |
| FUNCTION SWITCH4           | Function switch 4.                                                                                                                                                                                                                                                                                                                                          |
| OperatorType               | Identity OperatorType as follows:<br>1) Primary Operator: Control whether the RAN support some function feature and distribute second operator's license.                                                                                                                                                                                                   |

| Parameter ID  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               | <p>2) Second Operator: the RAN that is controlled by primary operator support some function feature and license.</p> <p>3) Outer Operator: Operator which don't include the Primary, Second operator of the source RNC handover the target RNC to support the mobility.</p> <p>4) Common Operator: Common Operator indicate PLMN ID the subscribe select as the same as the tradition network do in the sharing network. It is also the Serving operator.</p> |
| CnOpGrpIndex  | This parameter specifies the index of the operator group that serves the cell.                                                                                                                                                                                                                                                                                                                                                                                |
| CnOpGrpName   | Uniquely identifying Cn operator name.                                                                                                                                                                                                                                                                                                                                                                                                                        |
| CnOpNum       | Identify operator number in operator group which does not belong to the common operator number.                                                                                                                                                                                                                                                                                                                                                               |
| CnOpIndex1    | Cn Operator 1 index.                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| CnOpIndex2    | Cn Operator 2 index.                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| CnOpIndex3    | Cn Operator 3 index.                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| CnOpIndex4    | Cn Operator 4 index.                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| CnOpIndexComm | Common Operator Index.                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| SharingType   | Sharing Type Of NodeB.                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| CnOpIndex     | Index of operators.                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| CsNriCfgMode  | This parameter specifies feature mode of operators in the CS domain. You should configure the network resource identifier (NRI) when MOCN or Iu-Flex is supported.                                                                                                                                                                                                                                                                                            |
| PsNriCfgMode  | This parameter specifies feature mode of operators in the PS domain. You should configure the network resource identifier (NRI) when MOCN or Iu-Flex is supported.                                                                                                                                                                                                                                                                                            |
| CSNRILength   | NRI length for CS domain.                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| PSNRILength   | NRI length for PS domain.                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| NullNRI       | NullNRI VALUE indicate that ue assign load other CN node, when NNSF selects CN node.                                                                                                                                                                                                                                                                                                                                                                          |
| CnOpIndex     | Cn Operator index.                                                                                                                                                                                                                                                                                                                                                                                                                                            |

## 4.2 Values and Ranges

**Table 4-1** MOCN parameter values and parameter ranges

| Parameter ID               | Default Value | GUI Value Range                                                                                                                                                                  | Actual Value Range                                                                                               | Unit | MML Command                        | NE  |
|----------------------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|------|------------------------------------|-----|
| MOCNSupport                | -             | NO, YES                                                                                                                                                                          | NO,YES                                                                                                           | None | SET OPERATORSHARIN GMODE(Optional) | RNC |
| InterPlmnHoAllowedInterRat | -             | NO, YES                                                                                                                                                                          | NO,YES                                                                                                           | None | SET OPERATORSHARIN GMODE(Optional) | RNC |
| InterPlmnHoAllowedInterRat | -             | NO, YES                                                                                                                                                                          | NO,YES                                                                                                           | None | SET OPERATORSHARIN GMODE(Optional) | RNC |
| CommPlmnUsingType          | -             | NON-SUPPORTING_UE_ONLY(Non-Supporting UE Only), BOTH(Both), NEITHER(Neither)                                                                                                     | NON-SUPPORTING_UE_ONLY, BOTH, NEITHER                                                                            | None | SET OPERATORSHARIN GMODE(Optional) | RNC |
| DefaultCnOp                | -             | 0~3,255                                                                                                                                                                          | 0~3,255                                                                                                          | None | SET OPERATORSHARIN GMODE(Optional) | RNC |
| MocnControlSwitch          | -             | COMM_MOCN_NRI_GLOBAL_CONFIG_MODE_SWITCH, COMM_MIB_MULTI_PLMN_LIST_ALLOWED_SWITCH, SPARE_1_SWITCH, SPARE_2_SWITCH, SPARE_3_SWITCH, SPARE_4_SWITCH, SPARE_5_SWITCH, SPARE_6_SWITCH | COMM_MOCN_NRI_GLOBAL_CONFIG_MODE_SWITCH, COMM_MIB_MULTI_PLMN_LIST_ALLOWED_SWITCH, SPARE_1_SWITCH, SPARE_2_SWITCH | None | SET OPERATORSHARIN GMODE(Optional) | RNC |

| Parameter ID     | Default Value | GUI Value Range                                                                                                                                                                                                                                                                                                                          | Actual Value Range                                                                                                                                                                                                                                         | Unit | MML Command           | NE  |
|------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-----------------------|-----|
|                  |               | ITCH                                                                                                                                                                                                                                                                                                                                     | SPARE_3_SWITCH,<br>SPARE_4_SWITCH,<br>SPARE_5_SWITCH,<br>SPARE_6_SWITCH                                                                                                                                                                                    |      |                       |     |
| FUNCTION SWITCH4 | -             | DYNAMIC_POWER_ESTIMATION_FOR_MTCH,<br>ONE_TUNNEL,<br>MULCAR_SWOFF_BASEDON_TRALOAD,<br>CS_OVER_HSPA,<br>VOIP_OVER_HSPA,<br>96_HSDPA_USERS_PER_CELL,<br>HSPA_DOWN28_PER_USER,<br>HSPA_DOWN21_PER_USER,<br>96_HSUPA_USERS_PER_CELL,<br>MSCH_SCHEDULING,<br>MBMS_CHANNEL,<br>ENHANCED_CELL_FACH,<br>CPC_HS_SCH,<br>CPC_DTX_DRX,<br>UPLINK_MA | DYNAMIC_POWER_ESTIMATION_FOR_MTCH,ONE_TUNNEL,<br>MULCAR_SWOFF_BASEDON_TRALOAD,<br>CS_OVER_HSPA,<br>EDON_TRALOAD,CS_OVER_HSPA,96_HSDPA_USERS_PER_CELL,HSPA_DOWN28_HSDPA_USERS_PER_CELL,HSPA_DOWN21_PER_USER,96_HSUPA_USERS_PER_CELL,MSCH_SCHEDULING,MBMS_CH | None | ACT LICENSE(Optional) | RNC |

| Parameter ID | Default Value | GUI Value Range                                                                                                                                                                    | Actual Value Range                                                                                                                                                                                                                                             | Unit | MML Command                                    | NE  |
|--------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------------------------------------------------|-----|
|              |               | CRO_RECEIVE,<br>DOMAIN_ACCESS_CONTROL,<br>SERVICE_IN_RRC,<br>TCP_ACCELERATOR,<br>UPLINK_CONTROL_OF_USER,<br>MOCN_PACKAGE,<br>ETHERNET_OAM,<br>IUCS_UDP_MUX,<br>RNC_NODE_REDUNDANCY | ANNEL,<br>ENHANCED_CELL_FACH,<br>CPC_HS_SCH,<br>CPC_DTX_DRIVER,<br>UPLINK_MACRO_RECEIVE,<br>DOMAIN_ACCESS_CONTROL,<br>SERVICE_IN_RRC,<br>TCP_ACCELERATOR,<br>UPLINK_CONTROL_OF_USER,<br>MOCN_PACKAGE,<br>ETHERNET_OAM,<br>IUCS_UDP_MUX,<br>RNC_NODE_REDUNDANCY |      |                                                |     |
| OperatorType | -             | PRIM(Primary Operator),<br>SEC(Secondary Operator),<br>OUTER(Outer Operator),<br>COMM(Common Operator)                                                                             | PRIM,SEC,OUTER,COMM                                                                                                                                                                                                                                            | None | ADD CNOOPERATOR(Mandatory)                     | RNC |
| CnOpGrpIndex | -             | 0~31                                                                                                                                                                               | 0~31                                                                                                                                                                                                                                                           | None | ADD NRNCCELL(Mandatory)<br>ADD GSMCELL(Mandato | RNC |

| Parameter ID  | Default Value | GUI Value Range                                                 | Actual Value Range                | Unit | MML Command                                                            | NE  |
|---------------|---------------|-----------------------------------------------------------------|-----------------------------------|------|------------------------------------------------------------------------|-----|
|               |               |                                                                 |                                   |      | ry)<br>ADD<br>QUICKCELLSETUP(Mandatory)<br>ADD<br>CELLSETUP(Mandatory) |     |
| CnOpGrpName   | -             | -                                                               | 1~31 characters                   | None | ADD<br>CNOPERGROUP(Mandatory)                                          | RNC |
| CnOpNum       | -             | ONE(One),<br>TWO(Two),<br>THREE(Three),<br>FOUR(Four)           | 1,2,3,4                           | None | ADD<br>CNOPERGROUP(Mandatory)                                          | RNC |
| CnOpIndex1    | -             | 0~3,5~31                                                        | 0~3,5~31                          | None | ADD<br>CNOPERGROUP(Mandatory)                                          | RNC |
| CnOpIndex2    | -             | 0~3,5~31                                                        | 0~3,5~31                          | None | ADD<br>CNOPERGROUP(Mandatory)                                          | RNC |
| CnOpIndex3    | -             | 0~3,5~31                                                        | 0~3,5~31                          | None | ADD<br>CNOPERGROUP(Mandatory)                                          | RNC |
| CnOpIndex4    | -             | 0~3,5~31                                                        | 0~3,5~31                          | None | ADD<br>CNOPERGROUP(Mandatory)                                          | RNC |
| CnOpIndexComm | 255           | 5~31,255                                                        | 5~31,255                          | None | ADD<br>CNOPERGROUP(Optional)                                           | RNC |
| SharingType   | -             | DEDICATED(Dedicated),<br>RANSHARING(RAN Sharing),<br>MOCN(MOCN) | Dedicated,<br>RANSharing,<br>MOCN | None | ADD<br>NODEB(Mandatory)                                                | RNC |
| CnOpIndex     | -             | 0~3                                                             | 0~3                               | None | ADD<br>IPLOGICPORT(Mandatory)<br>ADD<br>ATMLOGICPORT(Optional)<br>ADD  | RNC |

| Parameter ID | Default Value | GUI Value Range                                                      | Actual Value Range                               | Unit | MML Command                                                                                                                                                    | NE  |
|--------------|---------------|----------------------------------------------------------------------|--------------------------------------------------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
|              |               |                                                                      |                                                  |      | RSCGRP(Mandatory)<br>ADD<br>ADJMAP(Mandatory)                                                                                                                  |     |
| CsNriCfgMode | -             | SUPP_NONE<br>,<br>SUPP_IUFLEX,<br>SUPP_MOCN<br>,<br>SUPP_IUFLEX_MOCN | SUPP_NONE,SUPP_IUFLEX,SUPP_MOCN,SUPP_IUFLEX_MOCN | None | SET OPERATORCFGPARA(Optional)                                                                                                                                  | RNC |
| PsNriCfgMode | -             | SUPP_NONE<br>,<br>SUPP_IUFLEX,<br>SUPP_MOCN<br>,<br>SUPP_IUFLEX_MOCN | SUPP_NONE,SUPP_IUFLEX,SUPP_MOCN,SUPP_IUFLEX_MOCN | None | SET OPERATORCFGPARA(Optional)                                                                                                                                  | RNC |
| CSNRILength  | -             | 1~10                                                                 | 1~10                                             | None | SET OPERATORCFGPARA(Mandatory)                                                                                                                                 | RNC |
| PSNRILength  | -             | 1~10                                                                 | 1~10                                             | None | SET OPERATORCFGPARA(Mandatory)                                                                                                                                 | RNC |
| NullNRI      | -             | 0~1023                                                               | 0~1023                                           | None | SET OPERATORCFGPARA(Optional)                                                                                                                                  | RNC |
| CnOpIndex    | -             | 0~3                                                                  | 0~3                                              | None | ADD CNOOPERATOR(Mandatory)<br>ADD CZ(Mandatory)<br>RST IU(Mandatory)<br>RST IURESOURCE(Mandatory)<br>ADD CELLCBSSAC(Mandatory)<br>SET IUTIMERANDNUM(Mandatory) | RNC |

| Parameter ID | Default Value | GUI Value Range | Actual Value Range | Unit | MML Command                                                                                                                                                                                                                                                                                                                                                                                                                    | NE |
|--------------|---------------|-----------------|--------------------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|              |               |                 |                    |      | ADD<br>CNNODE(Mandatory)<br>ADD<br>NRIGLBCNIDMAP(Mandatory)<br>ADD<br>IMSIIDNNSCNIDMAP(Mandatory)<br>ADD<br>RNCCBCPUID(Mandatory)<br>SET<br>OPERATORCFGPARA(Mandatory)<br>ADD<br>MBMSSA(Mandatory)<br>ADD<br>CELLMBMSSA(Mandatory)<br>ADD<br>LAC(Mandatory)<br>ADD<br>RAC(Mandatory)<br>ADD<br>SAC(Mandatory)<br>ADD<br>NODEB(Mandatory)<br>ADD<br>URA(Mandatory)<br>ADD<br>CBSADDR(Mandatory)<br>ADD<br>SAMBMSPARA(Mandatory) |    |



**NOTE**

The **Default Value** column is valid for only the optional parameters.  
The "-" symbol indicates no default value.

# 5

## Reference Documents

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The following lists the reference documents related to the feature:

1. 3GPP TS 23.236: Intra-domain connection of Radio Access Network (RAN) nodes to multiple Core Network (CN) nodes
2. 3GPP TS 25.875: Non Access Stratum (NAS) Node Selection Function
3. 3GPP TS 25.401: UTRAN Overall Description
4. 3GPP TS 25.410: UTRAN Iu Interface: General Aspects and Principles
5. 3GPP TS 25.413: UTRAN Iu Interface RANAP Signalling
6. 3GPP TS 25.331: Radio Resource Control (RRC)
7. 3GPP TS 23.251: Network Sharing Architecture and functional description
8. 3GPP TS 25.921: Service aspects and requirements for network sharing
9. Iu Flex Parameter Description
10. RAN Sharing Parameter Description
11. Basic Feature Description of Huawei UMTS RAN11.0 V1.5
12. Optional Feature Description of Huawei UMTS RAN11.0 V1.5